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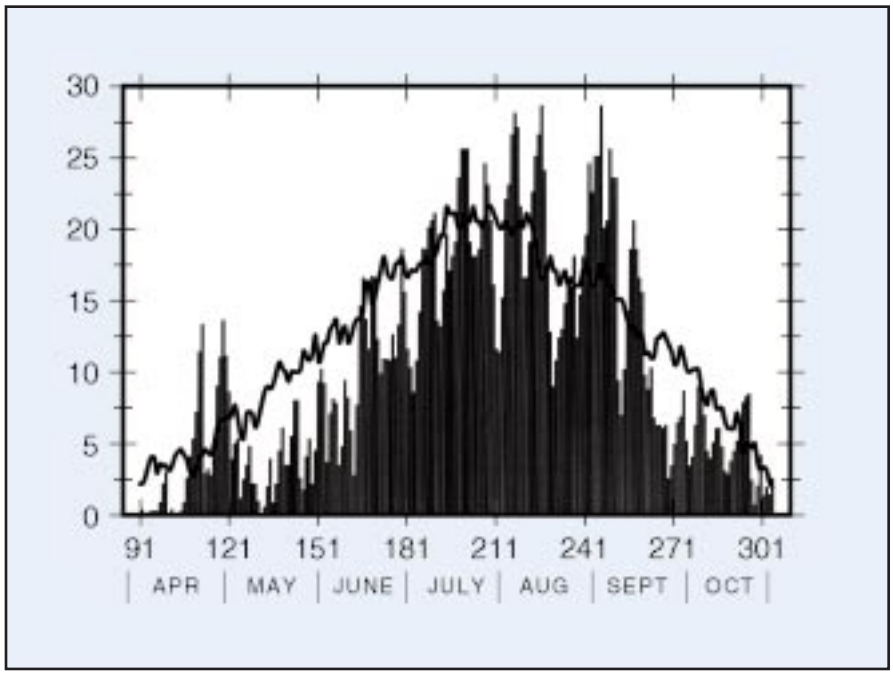
Weather Extremes Dock 1998 Crop

What can be learned from a year in which Mother Nature dealt some serious blows to producers all across the Cotton Belt? Extension cotton specialists from each of the four production regions share insights as to what happened in 1998 and what can be changed for a better 1999.

West (AZ, CA)

The West's strange start to the 1998 season included some of the lowest recorded heat unit accumulations in March through early June (Figure 1). In much of the region, cool, wet spring conditions continued from late-March into May, slowed development of planted fields, and delayed planting of many fields by as much as 4 to 5 weeks.



Hutmacher

Figure 1. Early low temperatures and heat units (bars) were well below the 30-year average (line) in the San Joaquin valley of California.

In California, these conditions resulted in a much higher-than-normal incidence of seedling diseases, including *Thielaviopsis basicola* (blackroot), *Rhizoctonia solani* and *Pythium ultimum* (Figure 2). Frequently, one or more of these seedling diseases combined with the cool weather and abnormally-high damage from thrips to produce weakened stands of cotton.

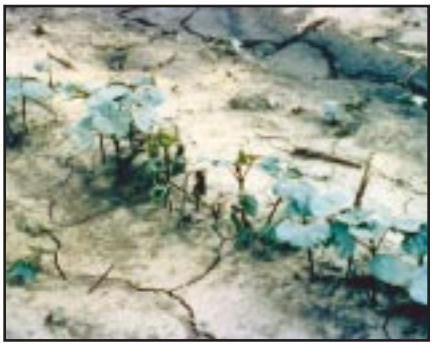


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Figure 2. In California, cold, wet weather and seedling diseases caused weakened stands.

INSIDE:

The Cotton Physiology Education Program (CPEP), now in its tenth year, is funded by a grant to the Cotton Foundation by BASF, makers of Pix®Plus plant regulator. CPEP's mission is to discover and communicate more profitable methods of producing cotton.

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Some higher elevations in Arizona escaped the poor early weather because cotton is normally planted later than it is at lower elevations. Consequently, the higher elevations experienced more normal crop development and yields.

Monsoon weather began in early July and lasted up to 8 weeks in much of Arizona. The high nighttime temperatures and humidity associated with the monsoons reduced yields. Because cotton development was slowed by cold, early-season weather, the monsoons caused more-than-typical damage to the 1998 crop. Fields which were only in mid-to-peak bloom during the worst of the monsoon conditions were severely affected (Figure 3).

Hutmacher

Figure 3. High temperatures and humidity caused brown squares, bolls, and bracts associated with fruit loss.

In the San Joaquin Valley of California, high temperatures in late July and during two periods in August similarly reduced fruit retention in some Acala varieties. Heat-related losses were greater in fields subjected to even moderate water stress during fruiting (Figure 3).

Lygus was the most troublesome insect in Arizona and California in 1998. Many crops grown in this region support lygus populations. Greater than normal growth of weeds and range plants in spring of this El Nino year also may have contributed to the sustained lygus populations which were experienced in 1998. Where lygus significantly reduced fruit retention, crops were further delayed and yields were reduced (Figure 4). Late-season management was more difficult.

Mild to severe damage caused by spider mites and armyworms contributed to an increase in control costs in some areas. Despite the lateness of the crop, silverleaf whitefly and aphid problems were generally much less severe than in recent years.

In response to a shortened growing season, many growers modified Pix®, irrigation and nitrogen management to avoid problems with excessive vegetative growth and a late crop. In California, adding insult to injury, temperatures and heat units were again low in much of September and throughout October. This cool, late-season weather made it difficult to mature late bolls which were present in many fields because of the late plantings.

Hutmacher

Figure 4. High lygus pressure reduced early and mid-bloom boll set.

Defoliant applications were generally delayed to allow more time to develop late-season bolls (Figure 5). Harvests were sometimes delayed by poor defoliation and, in some cases, by prolonged periods of fog and rain (Figure 6).

Hutmacher

Figure 5. The late crop delayed defoliation.

Hutmacher

Figure 6. Cool fall weather reduced harvest aid effectiveness, some leaves froze on plants.

In 1999, changes in varietal restrictions in the San Joaquin Valley's one quality regulations will greatly change the diversity of cotton varieties planted. Rather than restricting varietal choices to Acala and pima varieties approved by the San Joaquin Valley Cotton Board and some limited experimental varieties for testing, changes in regulations will allow plantings of a much broader range of varieties.

About 35,000 acres of non-Acala upland varieties were planted in 1998 under an emergency variance. Limited comparisons of these varieties with Acalas showed promise both in yield and some quality characteristics (albeit under unusual weather conditions), so many growers predict expanded acreage of these alternative upland varieties in 1999 and beyond.

Some of the newly available varieties may increase grower interest in shorter-season production as a way to reduce inputs and avoid some costs associated with late-season insect pests.

In Arizona, with several years' experience with Roundup-Ready and Bt transgenic varieties, there has been a relatively rapid adoption of specific transgenic varieties. Bt transgenics represented 60% of 1998 upland acreage, Roundup-Ready varieties 10%, and varieties with "stacked" Bt/Roundup-Ready were 11% of 1998 upland acreage.

In California in 1998, acreage in Roundup-Ready varieties was limited to about 7,000 acres grown under an experimental permit in the San Joaquin Valley, plus some limited acreage (estimated at less than 8,000 acres total) in southern California and the Sacramento Valley. In 1998, Bt varieties represented most of the planted 16,000 acres in the Palo Verde and Imperial Valleys of Southern California. Bt varieties were planted only on an experimental basis in the San Joaquin Valley because of a lack of approved Bt varieties.

With less-restrictive controls on varieties, more grower evaluations of transgenics will be expected in parts of the San Joaquin Valley this coming year. Grower interest in reduced-tillage production practices will likely increase with greater adoption of Roundup-Ready varieties.

Both Upland and pima cotton acreage in Arizona decreased from 1997. California pima acreage was unchanged from 1997, although Upland acreage dropped by about 200,000 acres.

Symptoms of bronze wilt were again observed in widespread areas in pima fields, resulting in significant yield losses mostly when the leaf damage and symptoms became pronounced during early fruit set (Figure 7).

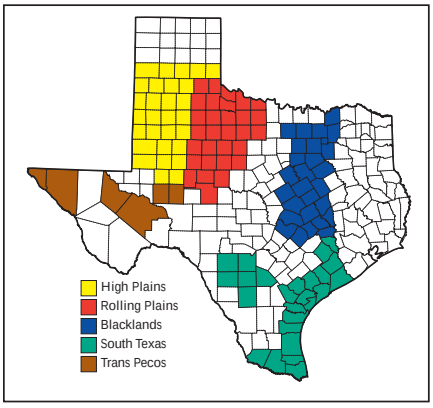
Hutmacher

Figure 7. Bronze wilt appeared in many pima fields, particularly in more determinate varieties.

Texas

The 1998 drought and heat wave reduced planted acreage from 1997 (down from 5.5 to 5.2 million acres). The USDA estimated harvested acreage of 3.1 million reflects the serious disaster encountered in dryland production in the state. USDA estimates of bale production were reduced considerably from 5.1 million in 1997 to 3.3 million in 1998. Except in those areas where adequate irrigation was available, yields were reduced. A warm fall provided additional heat units for late maturing fields, especially in the north. Moisture limitations and rapid heat unit accumulations encouraged early cutout.

Boll weevil eradication is ongoing in three zones in Texas: south Texas - Winter Garden, central Rolling Plains, and the southern Rolling Plains (Figure 8). These areas involved approximately 800,000 acres of cotton or 25% of the total harvested acreage in Texas. In 1997, the southern Rolling Plains were in their final eradication year. Both south Texas and the central Rolling Plains were in their first full eradication year, following two fall programs.



Lemon

Figure 8. Production zones of Texas.

Most of the state is now divided into eradication zones with proposed referendum votes to establish an assessment to take place prior to planting the 1999 crop. Only a limited number of these zones will be able to initiate eradication in the fall of 1999, even if all of them pass their referenda. The western High Plains' growers passed the referendum on December 17th so eradication efforts will begin in earnest. This program was passed contingent upon receiving additional funds from the state. The Texas legislature will meet in 1999, and boll weevil eradication funding will have to be addressed and passed.

Estimated Bt cotton acreage increased to a little more than 6% of the state's total planted acreage (about 210,000 acres). Growers found the Bt cotton helped them manage most Heliothine and pink bollworm problems. In 1998, there still were no commercially available stripper-type Bt cottons released for producer plantings.

State-wide planting of Roundup Ready varieties was estimated at 1.1 million acres. Of this amount, the stripper-type varieties represented about 1 million acres. Picker-type BXN varieties were planted on approximately 50,000 acres. The low amount probably reflects the labeling problem that Rhone-Poulenc encountered early in the year. There were no stripper-type BXN varieties available.

High Plains

The 1998 crop year was one of mixed extremes in the Texas High Plains. Record heat and record low rainfall during much of the production season was typical across the region (Figure 9). Rainfall ceased in April and left producers struggling to get the 1998 crop planted.

Boman

Figure 9. One of the driest summers on record produced frequent dust devils.

Irrigated fields were planted at typical times. However, high winds coupled with unseasonably high temperatures resulted in extremely high evapotranspiration losses during stand establishment. Variable emergence was observed in many fields. Record high temperatures in late May and early June exacerbated emergence and stand problems (Figure 10). Total rainfall from April through September was only 6 inches at Lubbock, with 4 inches of that total occurring in August. Warm soil temperatures allowed the establishment of very healthy stands north of Lubbock.

Boman

Figure 10. Very poor stands reflected harsh early season weather.

With the introduction of two new stripper-type varieties, Roundup Ready's 1 million acres was a big jump over the 300,000 acres harvested in 1997. Producers using irrigation planted most of the Roundup Ready varieties in the High Plains in 1998 (about one-half of the harvested acres in the High Plains).

Most of the dryland crop was dry-planted due to lack of soil moisture at the seeding depth. Over much of the High Plains, no subsequent rainfall was obtained to germinate the dryland crop, resulting in the loss of approximately 1.2 million acres of production. The arid environment encountered resulted in good to excellent square retention and boll set in many fields where soil moisture was not limiting.

The pumping pressure on the Ogallala aquifer was severe in many locations, with well output reduced by mid-season. Many producers had to renozzle center-pivot irrigation systems in order to optimize water use. The period from April through July set a record low for precipitation at Lubbock (1.9 inches), shattering the previous record of 3.2 inches during the dust bowl of 1934.

Fields with low-output wells and furrow irrigation were serious challenges to keep on track. Helpful rainfall was obtained in some furrow-irrigated areas with heavier textured soils. Lint yields were very good. Sandy land soils with low-output wells and furrow irrigation generally produced lower yields than normal.

Growers obtained much better water use efficiency and higher yields by using center-pivot irrigation systems, applying water as frequently as every 3.5 days, and using low energy precision applications (LEPA) in which pivots drag hoses fitted with socks in alternate, diked furrows (Figure 11). Subsurface drip irrigation systems also boosted yields, especially where irrigation capacities were very low.

Boman

Figure 11. LEPA irrigation (right) increased yields over conventional sprinkler irrigation (left).

By August, temperatures had moderated somewhat. Some rain fell, especially in counties north of Lubbock, which helped ease stress caused by drought in many fields. Because September temperatures were an average of 5.2 degrees higher than normal, fields north of Lubbock with late-set fruit (from August rains) were able to mature. At Lubbock, the total heat unit (DD60) accumulation from May through September in 1998 was 2880, versus the long-term average of 2270.

Because much of the crop reached cutout 10 to 14 days earlier than normal, many producers used harvest aids to take advantage of its earliness. Applications of ethephon boll opening materials were followed by termination with Cyclone. Cotton harvested early was very high quality, with excellent color and leaf with very low bark percentage.

October rains brought harvest to a standstill and little cotton was gathered for two weeks. Once harvest resumed, lint color was reduced, and leaf and bark increased slightly. Overall, fiber length and strength were slightly lower than the 1997 crop, but barky bales were a very low percentage. The USDA production estimate for the High Plains was 2.3 million bales in December, down from 3.4 million bales in 1997.

Surviving dryland fields ranged from one bale per acre down to 100 lb or less. Irrigated yields were simply a function of timeliness and amount of irrigation. Their yields ranged from 400 lb/acre to over 3 bales in some places.

Most producers of ultra-narrow row cotton were generally pleased with lint yields. Irrigation capacity and soil type were important for production on beds less than 30 inches wide. Many fields north of Lubbock with heavier-textured soils produced extremely high yields (as much as 3.5 bales per acre), where groundwater supplies remained strong and timely August rains fell.

Boman

Figure 12. Timely application of adequate water increased yields for growers of ultra narrow row cotton north of Lubbock.

Dry conditions limited weed problems early in the season. However, postemergence herbicide activity was reduced because of extremely hot, dry conditions. As a result of intense irrigation and reduced cultivation, many late-season pigweed escapes were observed in August. Weed control in Roundup Ready cotton was generally good, although activity on some perennial weed species was less effective than in previous years.

The drought reduced, but did not eliminate, development of damaging aphid and bollworm infestations. Boll weevils were held in check until August, when their numbers exploded to all time highs. Late-season weevil damage was minimized because of the rapidly maturing crop. Beet armyworm numbers were up, but seldom required treatment unless targeted in combination with other pests.

The net result of 1998 was an overall reduction in yield losses and control costs attributed to insect pests. The High Plains recorded the highest percent yield losses in the state due to boll weevils for the second consecutive year. Stripper-type Bt cotton varieties were not available to producers in 1998.

Blacklands

Drought slowed development of the Blacklands crop. Total rainfall for the April-through-August growing season, was about 4 inches. Although it was evenly distributed, very little rain fell in any single month during the growing season. A total of 2600 heat units (DD60) from mid-April to mid-August were recorded. In the bottomlands, considerable acreage of Deltapine 20 B and 33 B was planted, along with Deltapine 5690. Yields in the Blacklands ranged from about 200 to 300 lb/acre. The crop was very short, developed small bolls, and matured about 3 to 4 weeks earlier than normal. Late-season potassium deficiency was reported, and was not specific to any particular variety.

Trans-Pecos/St. Lawrence

A good start was encountered in this region. Hot, dry conditions prevailed, and producers with irrigation capability were generally pleased with greater than expected yields. Many producers chose to plant open boll type varieties and harvest their fields with stripper machines. The majority of upland cotton was planted to Bt varieties. Producers were very pleased with control of pink bollworm, although pressure from that insect pest was not as great as in some previous years. Bollgard varieties including the Paymaster picker types, Deltapine 35B and 33B yielded very well. Insect pressure was generally light, but boll weevil numbers came up toward the end. Some *Verticillium* wilt problems were encountered. Drip irrigated fields did exceptionally well with limited water, producing in the two bale range, whereas furrow irrigated fields produced considerably less.

Lower Rio Grande Valley and Gulf Coast

Except for the very earliest of plantings, weather at planting was exceptionally dry. The last rain of any significance during the growing season occurred in February. Both insect pests (including boll weevil) and beneficials were very light during the season, primarily because of the very hot and dry conditions.

Late February rainfall was enough to slightly delay planting. The cotton crop was produced on moisture stored in the soil profile. In the lower Gulf Coast region, fiber length was somewhat shorter than normal as a result of dry conditions. In the upper Gulf Coast area, higher micronaire problems were encountered.

Heat units were high during most of the crop season. However, during late April and May clouds and smoke from fires in the interior of Mexico provided continual overcast conditions and slightly reduced temperatures. Cotton matured rapidly due to the extremely hot and dry conditions this season. Yields ranged from 350 lb/acre in the lower Gulf Coast to 450 lb/acre in the upper Gulf Coast where more water was available.

Rolling Plains

Hot and dry was the norm for 1998. Only a haze of smoke from forest fires in central America broke the usual pattern of sunny days. Lack of soil moisture and temperatures at the time of planting caused problems in germination, and resulted in over 60% of the dryland crop being abandoned.

Insect pressure was light in the southern Rolling Plains, but thrips were extremely heavy and persistent in the north. Early fleahopper populations were light. Boll weevil populations were generally light outside the eradication zones.

Bollworm problems were confined mainly to irrigated fields, with budworms a problem in the central Rolling Plains. Bollgard varieties represented most of the acreage planted under irrigation. Beet armyworm moths were present over most of the northern area during the entire production season. In the central Rolling Plains, beet armyworms were extremely heavy and some late-planted dryland fields were damaged.

Eradication efforts continued to make progress in eliminating boll weevils. Abandoned acreage presented a challenge in monitoring scattered, sparse plants. Sharply reduced cotton acreage helped reduce boll weevil numbers.

Perennial weeds (silverleaf nightshade, nutsedge, and hog potato) seemed to be more problematic than normal. Weed control from postemergence herbicide applications was not as effective because the weeds were water-stressed.

Lint yields varied greatly across this area. Dryland acreage ranged from 65 to 150 lb/acre in the south, to up to 250 lb in the north. Fields with limited irrigation produced from 300 lb/acre to 1 bale, with well-watered fields making over 2 bales.

Oklahoma

The hottest and driest growing season on record, 1998 fields saw no rainfall from early May to August. Heat unit accumulation from mid-May to mid-September was approximately 2900 DD60s. As a result of the hot, dry weather, boll weevils were generally not a problem. Heavy beet armyworm damage was noted in irrigated areas. Bollworm pressure was normal to light in most fields.

Oklahoma planted 160,000 acres, with approximately 110,000 acres harvested. Overall bale production was estimated at 125,000. Bt cotton varieties were planted on 12,000 acres in 1998. BXN cotton varieties yielded well, although some problems were observed with control of morning glories with Buctril.

Interest in drip irrigation is growing, but its high initial cost and low cotton prices continue to limit its use. Oklahoma initiated a Boll Weevil Eradication Program with the fall diapause treatments in 1998. A full program will be initiated in 1999.

New Mexico

New Mexico produced a relatively good crop despite many insect problems and adverse weather conditions. The cotton yields were somewhat above average. The 1998 crop started out behind schedule with cool May and June temperatures. July and August heat helped the crop to catch up. Many growers managed for earliness by using Pix plant growth regulator, early irrigation termination, and applications of boll openers and defoliants.

Total upland cotton acreage was about the same as last year, about 59 thousand acres. Acreage of Bt cottons increased from 1997. Generally, the Bt varieties performed well, especially where no insecticides were applied (e.g. near schools and homes).

Results from on-farm trials conducted by the Cooperative Extension Service indicated that purple nutsedge control was good in Roundup Ready cotton. Limited acreage of Roundup Ready varieties was planted in 1998.

Verticillium wilt, the most devastating disease in New Mexico, was observed in three of the Paymaster picker varieties (1220 BG/RR, 1330 BG, and 1560 BG) in on-farm variety trials.

Late cotton suffered most from boll weevils, pink bollworms, aphids, and whiteflies, particularly in the Mesilla Valley production areas. These late-season insects are excellent reasons to recommend early crop termination and clean field management techniques. When planning for the 1999 growing season, growers should consider management practices which favor earliness of the crop.

The Mesilla Valley producers have an active boll weevil eradication program underway. The first year diapause program was conducted in the 1998 crop. Producers in the Pecos Valley are conducting a voluntary boll weevil program.

Mid-South **(AR, LA, MO, MS, TN)**

Hot, dry weather plagued the Mid-South most of the season. When rains came they were untimely and not welcomed. This weather pattern resulted in some of the worst production for many crops in the last decade.

The 1998 cotton crop looked pretty good by mid-July, but by mid-August the heat had taken its toll. Degree day accumulations (DD60's) were much higher compared to previous years. The extreme heat combined with drought placed the crop under severe stress. In addition to drought, some varieties were affected by bronze wilt, which further reduced yield. Late season rains added insult to injury, by creating conditions conducive for boll rot, as well as causing the crop to begin growing again. Rank growth made defoliation difficult and costly.

Acreage for the area totaled 3,085,000, ranging from 350,000 acres in Missouri to 915,000 acres planted in Mississippi. USDA yield estimates for November ranged from 524 to 776 lb/acre across the Mid-Southern states. Compared to the five year average, yield was down 6.3%. While transgenic varieties were grown in all mid-south states, the bulk of this acreage was in Louisiana and Mississippi. Poor yields and insulting prices have left a bitter taste in producers' mouths.

What next year holds is anyone's guess. It is uncertain where acreage will go, as this will depend on producers' abilities to secure monies for farming. Boll weevil eradication programs will be implemented in several states and should prove to

help reduce costs, based on the history of other state's programs.

Arkansas

By July 1st, Arkansas growers expected one of their best crops ever on 900,000 acres. However, by mid-July those hopes had evaporated. Drought or floods pushed yields down to 651 lb/acre and grades below average. Bronze wilt devastated some crops in northeast Arkansas.

Late season rains germinated some seed in the boll and made defoliation more expensive by necessitating repeat applications of defoliant. Boll weevil eradication will continue in southwest Arkansas and begin in the southeastern part of the state in 1999.

Louisiana

Record heat and lack of rain spelled disaster for Louisiana's 525,000 acre crop. Yields (590 lb/acre) and grades were the poorest in 15 years. Bronze wilt occurred in several varieties. Late season rains complicated defoliation and increased the incidence and severity of boll rot. Boll weevil eradication will continue for the third year in the Red River area and begin the first year in northeast Louisiana.

Mississippi

Mississippi out-yielded the other Mid-South states with an average of 740 lb/acre and also harvested more acreage (940,000 acres), although both values weres still less than the 5 year averages. Low yields, only fair quality, and depressed prices added up to a bad year for Mississippi growers.

Insects, particularly boll weevils, aphids and worms, were prevalent and contributed to high pesticide bills. Late season rains complicated harvest and contributed to boll rot, further reducing yields.

Padgett

Figure 13. Efforts will be stepped up to eradicate the boll weevil in 1999.

Missouri

Growers produced an average of 471 lb/acre on 357,000 acres – a whopping 209 lb/acre down from the 5-year average. Only 2% of acreage was planted to Bt. BXN and Roundup Ready cottons were widely planted. Drought followed by late-season floods contibuted to production costs for most growers. Bronze wilt also devastated several varieties.

Tennessee

Tennessee producers brought in close to their five year average yield with 588 lb/acre on 445,000 acres. Transgenic cotton ranged from 5% planted in Bt cotton to 15% in Roundup Ready and 40% in BXN. Although rains occurred through August 10th, boll weevil pressure was high. Eradication will continue in 1999.

Southeast **(AL, FL, GA, NC, SC, VA)**

Southeastern cotton growers faced varied challenges in 1998. Many growers began 1998 in financial difficulty as a result of reduced cotton yields and fiber quality in 1997. Cotton producers in the region needed high yields coupled with high market prices to regain financial stability. Unfortunately, the 1998 season was marked by serious weather influences that limited fiber yields and lint quality, and cotton prices continued to be stagnant and remained below $0.70/lb for most of the growing season.

Heavy rains began in mid-September of 1997 and continued until mid-April. This delayed field preparation and resulted in a general delay and reduction in planted cotton acreage across the region.

In mid-April, weather conditions turned hot and dry, almost August-like. Occasional scattered showers occurred in June and July, but most of the region experienced extremely dry conditions coupled with high temperatures that moved the development of the crop along rapidly, parching profits from most dryland acreage and limiting yields in irrigated fields. In many situations, irrigation systems could barely maintain water needs of the crop.

By late July, many cotton fields had rapidly advanced toward pre-

mature cutout, with many fields containing cotton plants blooming out-the-top (NAWF = 1 or 2) within four weeks of first bloom. For most of the region, late-July rains and hurricanes brought much-needed moisture to parched fields and partial relief from the searing drought. This was too late to help increase cotton yields for most of the acreage.

Plant terminals in fields that had previously cutout began to grow again. A few fields produced an adequate late-season top-crop. Generally, this late-season moisture was too late to do much more than fill out existing bolls. August rains increased the incidence of boll rot, rejuvenated vegetative growth and squaring, increased late-season insect pressure, and brought significant regrowth.

Harvest-aid decisions were complicated by regrowth. Most areas had poor defoliation. Mid-season high temperatures and insect pressure caused fruiting gaps in many fields, further complicating harvest-aid decisions. Growers were torn between picking the bottom crop or managing the top crop.

Smaller boll size, increased micronaire and shorter staple length caused by extremely high temperatures throughout the growing season resulted in grower disappointment at harvest time. Due to problems related to weather conditions and management decisions, total harvested acreage, lint yield, and bale production decreased compared to 1997.

Southeast growers continued to plant a considerable portion of their acreage in transgenic *Bt* cotton varieties in 1998 (approximately 1.1 million acres), and significantly increased their acreage of transgenic Roundup-Ready varieties (0.9 million acres).

In an effort to reduce production costs, many growers experimented with new production systems, such as ultra-narrow row cotton (Figure 14). Ultra-narrow row cotton consists of planting cotton at extremely high populations (approximately 100,000 plants/acre) in rows spaced 24 inches or closer, and was planted on approximately 40,000 acres in the Southeast in 1998. Grower experiences with UNR cotton ranged from poor to extremely satisfied.

Jones

Figure 14. Ultra narrow row cotton production stripper-harvested.

Alabama

Dry weather and rapid heat unit accumulation associated with above normal temperatures in May, June, and July caused cotton to develop extremely rapidly in Alabama. Many fields cutout prematurely and some were harvested as early as late August.

Hurricane Georges pounded the coast of Alabama in early-September. Lint was blown out of the burs of cotton that was defoliated and ready to harvest. Younger cotton that was not yet defoliated was leveled by the winds. Subsequent machine harvest was difficult and boll rot of unopened, immature bolls was prevalent. Yield losses of 90 to 100% occurred in many fields. Heavy rains that occurred following Georges caused additional yield and quality losses.

Average yields of 601 lb/acre were similar to the 5 year average of 595 lb/acre. Transgenic cotton varieties were planted on a large percentage of the acreage, with common varieties planted including NuCotn 33 and NuCotn 35B, DP 90B and 32B, and PM 1220RR.

Florida

Florida planted 85,000 acres and harvested 80,000 acres of cotton in 1998. Yields averaged only 498 lb/acre, which reduced total production to 83,000 bales. Wet early-season conditions and dry weather during vegetative development and early reproductive development decreased fruit production and retention and reduced yields and fiber quality. Lint production was further reduced by two late-season hurricanes which resulted in hard-locking of later-maturing bolls and blew out lint from earlier-maturing bolls. Of the estimated 85,000 acres planted in Florida, approximately 60% of this acreage was planted to transgenic varieties. Popular varieties included NuCotn 33B and NuCotn 35B, PM 1220RR, and ST 474.

Georgia

Throughout the growing season, severe drought limited planted acreage and production in Georgia. Total acreage planted was estimated at 1.37 million acres, which was 4.9% below 1997 planted acreage, but 15.6% more than the 5-year average for the state.

Terrible weather during the 1997 harvest influenced many producers to commit considerable acreage in 1998 to early-maturing varieties so they could get their crops out earlier. Stacked gene technology (Bt and Roundup-Ready) was available in a few early-maturing varieties. Approximately 47% of Georgia's crop was Bt varieties, and another 34% was Roundup-Ready technology. As many as 150,000 acres were planted in a relatively new variety (Paymaster 1220 B/RR). Other popular varieties included NuCotn 35B, NuCotn 33B, DP 5690RR, and DP 90B.

Insect pressure varied across the state. Pyrethroid resistance in tobacco budworm was confirmed from collections in southwest Georgia. Stink bugs were a serious pest, particularly in low-spray situations and Bt cotton.

Growers liked the broad spectrum of weeds controlled with Roundup-Ready technology and the convenience afforded by making topical applications. However, some producers reported root abnormalities, bronze wilt, and abnormal fruit shed in their crops.

Bronze wilt severely affected late-planted cotton in many counties of southern and central Georgia, with over 20,000 acres affected to some extent. Symptoms of bronze wilt included bronze discoloration of foliage in the upper canopy, severe reddening of the stem and petioles, abortion of immature fruit, and elevation in leaf temperature in affected foliage (Fig. 15). This progressed to total plant wilt or collapse of the affected plant, near total fruit shed, and plant death. Reported cases ranged from a few random plants in an affected field to complete stand loss.

Jones

Figure 15. Bronze wilt occurred in some fields.

Numerous acres were abandoned or destroyed in east Georgia because of poor yields. For the third year in a row, the southwestern corner suffered significant boll rot due to late-season rains. Total harvested acreage was only 1.3 million acres, which was less than 1997. The final yield was 517 lb/acre, which was the lowest in more than 12 years. Reduced yields coupled with reduced harvested acreage and low prices lowered cash receipts to well below $550 million.

North Carolina

Throughout the season the state's 1998 crop suffered from intense heat and lengthy periods of dry weather. The southern and western counties experienced spotty rainfall that seemed to return to the same spots, leaving other areas parched with only a few bolls per plant. The northern counties were more fortunate and encountered extremely good environmental conditions throughout most of the season and were in better shape than 1997.

Above normal heat unit accumulation pushed crop development along rapidly and contributed to poor fruit retention in some varieties. Hurricane Bonnie brought late-season wet weather, which led to significant boll rot and plant lodging.

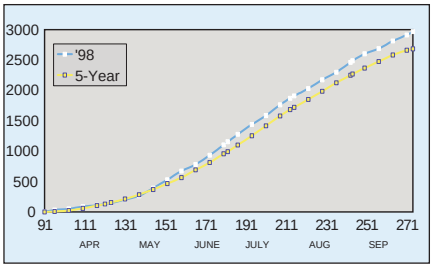
North Carolina yields in 1998 were 669 lb/acre. North Carolina growers harvested 710,000 acres of cotton in 1998 compared to 675,000 acres in 1997 and the five-year average of 617,000. Growers planted approximately 32% of North Carolina's acreage to Roundup-Ready varieties and approximately 15,000 acres of ultra narrow row cotton in 1998. Primary varieties planted included DP 51, PM 1220RR, DP 5415 RR, DP 5690 RR, and SG 125.

South Carolina

Because of extremely wet weather from September to mid-April, planting operations were delayed compared to normal planting dates for the state. Approximately 15 to 20% of the crop was planted extremely late (after May 21st). This later crop received more timely rainfalls during late-July and August and produced better than average yields compared to many crops planted earlier.

Heat unit accumulation was extremely rapid this year (Figure 16). Cotton development was ahead of schedule throughout most of the season. Northern counties were parched and received little relief from hurricane Bonnie. Southern counties received scattered rainfall at times during the season, but remained droughty during most of the growing season.

Budworm infestations were the heaviest in over 15 years, and the first pyrethroid-resistant larvae were found in a cotton field in Sumter



Jones

Figure 16. Heat units accumulated throughout the season were higher than the 5-year average.

County. Nearly half of the fields planted to conventional cotton received an insecticide application between mid-June and the first week of July.

Bollworm infestations were also intense, and pyrethroid-resistant worms were found in several fields below the lakes. Stink bugs, beet armyworms and thrips were also economically important. Only one boll weevil was captured in a pheromone trap in April; this is the lowest number since the eradication program began in 1983.

Past difficulties controlling Palmer amaranth and sicklepod led many growers to plant Roundup-Ready cotton varieties to help manage these weeds. Approximately 45% of all acreage planted in South Carolina this season contained the Roundup-Ready gene, and this percentage is predicted to increase dramatically in 1999.

Final lint yield in 1998 is estimated at 600 lb/acre, which is 74 lb less than 1997 and 63 lb less than the 5-year average. Total acreage harvested was 280,000 for the state, and total bales produced were

350,000. Major varieties planted included DP 5690RR, DP 5415RR, DP 5690, DP 90RR and NuCotn 33B.

Virginia

Most of Virginia's cotton crop was planted between May 10th and 20th, which is slightly later than the normal planting date. Extremely wet conditions from mid-October of 1997 to mid-April delayed field preparation and planting. Conditions during early vegetative development were favorable for good germination, emergence, and seedling vigor, and resulted in rapid early-season crop development. This excellent start set the tone for an excellent crop in 1998.

Conditions changed in June as dry, hot weather occurred throughout most of July and August, with only a few scattered showers from hurricanes. These scattered showers were timely and allowed late-developing bolls to fill and mature. High heat unit accumulation, which is normally a limiting factor in this state, provided an excellent environment for extremely high boll load and contributed to an excellent cotton crop. Virginia averaged 770 lb/acre in 1998, which was the highest yield reported in the Southeast in 1998.

The cooler night temperatures that existed in the state during the season may have allowed plants to recuperate from the relentless heat that existed during the days throughout the Southeast in 1998. These warm, dry conditions continued during the harvest-season and provided growers with excellent conditions for harvesting.

A new cotton gin was constructed on the Eastern Shore of Virginia (between the Chesapeake Bay and the Atlantic Ocean). Increased cotton acreage is expected north of the James River and on the Eastern Shore area in 1999. Major varieties planted in Virginia included DP 51, ST 474, SG 125, DP 5415RR, and PM 1244RR.

Beltwide Summary

The varieties planted to the most acreage in the different regions are listed in Table 1. Transgenics totaled about 45% of plantings.

Table 1. Approximate percentage of total planted acreage by region in specific cotton varieties in 1998.

Region	Company	Variety	~ % Acreage
West	CPCSD*	Acala Maxxa	40.74
	Deltapine	NuCotn 33B	15.41
	CPCSD*	Acala GTO M	8.51
	Sure-Grow	SG 125	2.86
	Phytogen	PHY 33 Acala	2.66
	Deltapine	DP 5415	2.09
	Deltapine	DP 6211 Acala	1.97
Southwest	Paymaster	HS 26	15.28
	Paymaster	PM 2326 RR	12.76
	Paymaster	PM 2200 RR	9.26
	Paymaster	HS 200	7.50
	Deltapine	DP 50	6.27
	All-Tex	Atlas	3.25
	Tamcot	Sphinx	2.79
Mid-South	Stoneville	BXN 47	18.88
	Stoneville	ST 474	16.87
	Deltapine	NuCotn 33B	13.10
	Sure-Grow	SG 125	5.03
	Deltapine	DP 51	3.60
	Stoneville	ST 4740	3.54
	Paymaster	PM 1220 RR	3.22
Southeast	Deltapine	NuCotn 33B	11.35
	Deltapine	NuCotn 35B	6.04
	Deltapine	DP 5690 RR	10.56
	Paymaster	PM 1220 RR	5.07
	Deltapine	DP 5415 RR	4.94
	Paymaster	PM 1220 BG/RR	4.94
	Sure-Grow	SG 125	4.68

*California Planting Cotton Seed Distributors

USDA

Harvested acreage in 1998 decreased in all regions of the Cotton Belt compared to 1997. Only the Southeast showed an increase in harvested acreage compared to the 5 year average (Table 2).

Table 2. Harvested acreages of U.S. upland cotton — '98, '97, and over the last five years (5 year).

	Acreage, million acres		
REGION	'98	'97	5 Year
West	0.90	1.20	1.36
Southwest	3.24	5.58	5.39
Mid-South	3.09	3.39	4.04
Southeast	2.92	3.01	2.67
TOTAL	**10.14**	**13.18**	**13.47**

USDA

Except for the Southwest, 1998 yields decreased in all regions of the Cotton Belt compared to 1997 and 5-year averages (Table 3). Overall Beltwide yields decreased by 7% over 1997 yields and by 3% over the 5-year average yields.

Table 3. Yields of U.S. upland cotton — '98, '97, and 5-year averages.

Region	Yield, pounds per acre		
	'98	'97	5 Year
West	924	1204	1165
Southwest	525	483	451
Mid-South	654	799	695
Southeast	583	638	652
Average	616	665	636

USDA

Production in million bales decreased 29% Beltwide from 1997 and 27% from the five-year average (Table 4). All regions experienced a drop in number of bales produced.

Table 4. Production of U.S. upland cotton — '98, '97, and 5-year averages.

Region	Production, million bales		
	'98	'97	5 Year
West	1.73	3.02	3.30
Southwest	3.55	5.61	5.07
Mid-South	4.21	5.64	5.86
Southeast	3.54	4.00	3.63
Average	13.02	18.27	17.86

USDA

Conclusions

Reductions in acreage, yields, and bales produced were the sobering reality of a crop that experienced weather extremes all across the Cotton Belt. Promising possibilities for 1999 include new varieties, progress in boll weevil eradication, new irrigation methods, variable rate applications, and production systems such as ultra narrow row cotton. A better price would also help.

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